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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/574,120	05/31/2007	Michel Bruel	5310-09500	7416

35690 7590 06/21/2010

MEYERTONS, HOOD, KIVLIN, KOWERT & GOETZEL, P.C.
P.O. BOX 398
AUSTIN, TX 78767-0398

EXAMINER	
KHARE, ATUL P	

ART UNIT	PAPER NUMBER
1791	

NOTIFICATION DATE	DELIVERY MODE
06/21/2010	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patent_docketing@intprop.com
ptomhkkg@gmail.com

Office Action Summary	**Application No.** 10/574,120	**Applicant(s)** BRUEL, MICHEL	
	Examiner ATUL KHARE	**Art Unit** 1791	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _02 June 2010_.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _1-20 and 29-33_ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _1-20 and 29-33_ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. The amendment filed 02 June 2010 has been entered and fully considered.

2. Claims 1-20 and 29-33 are currently pending. Claims 21-28 have been cancelled.

3. No new matter has been found.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

6. Claims 1-4, 6, 7, 11, 12, 14, 18, 20, 31, and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Moriceau et al. (WO 99/35674). For examination, (US 6,756,286) is used as an English Language Equivalent.

7. As to claims 1-3, Moriceau teaches in a method for transferring a thin film: producing by epitaxy a silicon film 32 on an initial substrate 31, wherein the film 32 is strongly doped with boron atoms (column 12 lines 40-45, figure 7). Film 32 meets the required intermediate layer, and the boron atoms meet the required extrinsic atoms. Film 32 is subsequently coated with a slightly doped silicon film 33, which is further coated with a silicon oxide film 34 (column 12 lines 45-50). The highly doped silicon film 32 will act as an inclusions zone (column 12 lines 49-50). An inclusion is a volume that may have a variety of shapes and dimensions which may vary from a few tens of nanometers to several hundreds of micrometers, and inclusions acts as traps for implanted gaseous compounds (column 2 lines 25-35). These inclusions meet the required micro-bubbles or micro-cavities (column 10 lines 13-17). After coating with the oxide layer 34, gaseous compound implantation is submitted through the top surface of the entire substrate containing layers 31-35 (column 12 lines 51-54). The top surface 35 of the substrate is bonded by (molecular) wafer bonding to a silicon plate (column 12 lines 55-57). The silicon plate meets the required superstrate. Heat treatment is then performed to separate the structure 30 into two parts by means of a fracture at the inclusions zone in film 32 (column 12 lines 58-64). Moriceau teaches that inclusions may be generated particularly by a change in the chemical nature of a substrate by, for example, a doping effect (column 5 lines 20-33). The inclusions are thus produced as a result of dopant, and the dopant causes, either directly or indirectly, the formation of micro-bubbles and micro-cavities in the highly doped silicon film.

Moriceau teaches that inclusions are present in the highly doped layer 32, but Moriceau does not appear to explicitly disclose the step of forming the inclusions in this intermediate layer. However, Moriceau teaches that inclusions can be formed by heat treatment (column 3 lines 63-65, column 9 lines 30-32). Heat treatment is capable of weakening the substrate at the inclusions layer to enable separation at that layer (column 4 lines 10-13). It would have been obvious to use heat treatment as a conventional means for forming the required inclusions zone in the highly doped intermediate layer 32. Since heat treatment forms inclusions in the intermediate layer, the heat treatment step implicitly renders the intermediate layer plastically deformable as required by the claims.

8. As to claim 4, Moriceau teaches that subsequent to heat treatment, mechanical stresses can be used to cause separation of the substrate at the inclusions layer (column 4 lines 42-44). It would have been obvious to apply mechanical stresses as a means for causing separation at the intermediate inclusions layer 32.

9. As to claim 6, the intermediate film 32 is formed of doped silica as described in the rejection of claim 1 above. Moriceau does not appear to explicitly disclose that the silicon substrate/superstrate referred to in the rejections above is a monocrystalline silicon. However, Moriceau teaches that there are many deposition techniques chosen as a function of the materials to be prepared, which can be monocrystalline (column 5 lines 62-64). It would have been obvious to make the silicon substrate 31 and superstrate (silicon plate) from monocrystalline silicon as a conventional material used for transferring a thin film of solid material.

10. As to claim 31, the micro-bubbles or micro-cavities described in the rejection of claim 1 meet the requirement of being open-celled and also constitute channels.

11. As to claim 33, the final product of Moriceau is suitable for the required intended uses (column 5 lines 10-12, MPEP 2111.02).

12. As to claims 7, 12, and 20, Moriceau teaches in a method for transferring a thin film: producing by epitaxy a silicon film 32 on an initial substrate 31, wherein the film 32 is strongly doped with boron atoms (column 12 lines 40-45, figure 7). Film 32 meets the required intermediate layer, and the boron atoms meet the required extrinsic atoms. Film 32 is subsequently coated with a slightly doped silicon film 33, which is further coated with a silicon oxide film 34 (column 12 lines 45-50). The highly doped silicon film 32 will act as an inclusions zone (column 12 lines 49-50). An inclusion is a volume that may have a variety of shapes and dimensions which may vary from a few tens of nanometers to several hundreds of micrometers, and inclusions acts as traps for implanted gaseous compounds (column 2 lines 25-35). These inclusions meet the required micro-bubbles or micro-cavities (column 10 lines 13-17). After coating with the oxide layer 34, gaseous compound implantation is submitted through the top surface of the entire substrate containing layers 31-35 (column 12 lines 51-54). The top surface 35 of the substrate is bonded by (molecular) wafer bonding to a silicon plate (column 12 lines 55-57). The silicon plate meets the required superstrate. Heat treatment is then performed to separate the structure 30 into two parts by means of a fracture at the inclusions zone in film 32 (column 12 lines 58-64). Moriceau teaches that inclusions may be generated particularly by a change in the chemical nature of a substrate by, for

example, a doping effect (column 5 lines 20-33). The inclusions are thus produced as a result of dopant, and the dopant causes, either directly or indirectly, the formation of micro-bubbles and micro-cavities in the highly doped silicon film.

Moriceau teaches that inclusions are present in the highly doped layer 32, but Moriceau does not appear to explicitly disclose the step of forming the inclusions in this intermediate layer. However, Moriceau teaches that inclusions can be formed by heat treatment (column 3 lines 63-65, column 9 lines 30-32). Heat treatment is capable of weakening the substrate at the inclusions layer to enable separation at that layer (column 4 lines 10-13). It would have been obvious to use heat treatment as a conventional means for forming the required inclusions zone in the highly doped intermediate layer 32. Since heat treatment forms inclusions in the intermediate layer, the heat treatment step implicitly renders the intermediate layer plastically deformable as required by the claims. Since intermediate film 32 is comprised of similar materials used by applicant, its functional properties (including that of being dielectric) are a necessary result in the prior art.

13. As to claim 11, Moriceau teaches that the heat treatment applied to create the inclusions zone is above 1000°C (column 9 lines 30-45), which overlaps with the claimed range. It would have been obvious to apply a heat treatment temperature above 1000°C as a conventional means for generating the inclusions in intermediate layer 32. Additionally, Moriceau teaches that the heat treatment is determined based on the properties of the inclusions layer (column 3 lines 60-62). A person having ordinary skill in the art would recognize that the heat treatment influences the generation of inclusions

in the highly doped intermediate layer, making it a result effective variable. Because it is a result effective variable and Moriceau teaches its use, it would have been obvious to optimize the heat treatment to attain the desired level of inclusions in the highly doped intermediate layer.

14. As to claim 14, Moriceau teaches that subsequent to heat treatment, mechanical stresses can be used to cause separation of the substrate at the inclusions layer (column 4 lines 42-44). It would have been obvious to apply mechanical stresses as a means for causing separation at the intermediate inclusions layer 32.

15. As to claim 18, the micro-bubbles or micro-cavities described in the rejection of claim 1 meet the requirement of being open-celled and also constitute channels.

16. As to claim 20, the final product of Moriceau is suitable for the required intended uses (column 5 lines 10-12, MPEP 2111.02).

17. Claims 5, 8-10, 15-17, 19, 29, 30, and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Moriceau et al. (WO 99/35674) as applied to claims 1-4, 6, 7, 11, 12, 14, 18, 20, 31, and 33 above, and further in view of Haberger et al. (US 6,417,075). For the purposes of examination, (US 6,756,286) will be used as an English Language Equivalent for WO 99/35674.

18. As to claim 5, Moriceau does not appear to explicitly disclose chemically attacking the intermediate layer to cause separation. However, Haberger teaches in a method for producing thin substrate layers: separating two substrates by attacking an intermediate bonding layer in a wet chemical detachment process (abstract). It would

have been obvious to substitute the chemical detachment process of Haberger for the separation process of Moriceau as a conventional means for causing separation between two silicon layers.

19. As to claim 8, the examiner notes that applicant has only included boron when phosphorus is also present, meaning that the claim does not include BSG as a possible glass material for the intermediate layer. Moriceau does not appear to explicitly disclose the use of phosphorus as a dopant for the intermediate layer. However, Haberger teaches in a method for producing thin substrate layers: using doped oxides such as PSG (phosphosilicate glass) or BPSG (borophosphosilicate glass) as the intermediate bonding layer in order to increase the etching rate in chip detachment (column 7 line 66 to column 8 line 3, claim 16). To create a doped PSG or BPSG, phosphorus atoms or a mix of boron and phosphorus atoms respectively must be used as a dopant for the intermediate layer. It would have been obvious to substitute phosphorus, or a mix of boron and phosphorus, as the dopants for the intermediate layer as taught by Haberger with the boron dopant of Moriceau as an improvement to increase rate of detachment.

20. As to claim 9, modified Moriceau does not appear to explicitly disclose the concentration of phosphorus in the highly doped inclusions layer. However, Moriceau teaches that inclusions may be formed by a doping effect (column 5 lines 20-21 and 30-33). Moriceau further teaches that the degree of doping (with boron, or in the combination of references, with boron and/or phosphorus to make PSG/BPSG) has an effect on the formation of an inclusions zone (column 7 lines 24-45). A person having ordinary skill in the art would recognize that the degree of doping influences the

formation of an inclusions zone, making it a result effective variable. Because it is a result effective variable and modified Moriceau teaches its use, it would have been obvious to optimize the degree of doping to attain the desired inclusions zone formation, and the claim is met.

21. As to claim 10, modified Moriceau does not appear to explicitly disclose the concentration of boron in the highly doped inclusions layer. However, Moriceau teaches that the degree of doping (with boron) has an effect on the formation of an inclusions zone (column 7 lines 24-45, column 12 lines 49-50). A person having ordinary skill in the art would recognize that the degree of doping influences the formation of an inclusions zone, making it a result effective variable. Because it is a result effective variable and Moriceau teaches its use, it would have been obvious to optimize the degree of doping to attain the desired inclusions zone formation, and the claim is met.

22. As to claim 15, Moriceau does not appear to explicitly disclose chemically attacking the intermediate layer to cause separation. However, Haberger teaches in a method for producing thin substrate layers: separating two substrates by attacking an intermediate, sacrificial bonding layer in a wet chemical detachment process (abstract, column 4 lines 12-13, column 4 lines 20-24). It would have been obvious to substitute the chemical detachment process of Haberger with the separation process of Moriceau as a conventional means for causing separation of silicon platelet 31 from the silicon plate (superstrate) via the intermediate layer having micro-cavities formed therein (described above).

23. As to claims 16 and 17, Moriceau does not appear to explicitly disclose producing projecting portions in the substrate or superstrate on the intermediate layer side. However, Haberger teaches in a method for producing a thin substrate: forming a bonding (intermediate) layer having channel-shaped recesses in order to permit the penetration of an etching agent for subsequent separation (abstract, column 3 lines 63-66). The bonding layer with recesses formed therein/thereon is depicted at figures 1a and 1b. The formation of channel-shaped recesses constitutes the formation of rectilinear projecting portions extending to the sides of the intermediate layer (since it extends along the sides through the substrate depicted at figure 1). Since the substrates 1 and 2, and bonding layer 4 having channels 5, are formed into an integral structure at figure 1b, the bonding layer 4 is a part of the substrates 1 and 2, so the channels are also formed in the substrates as required by the claims (See MPEP 2144.04 V Section B). Alternatively, the channels can be formed in either substrate (column 4 lines 54-57). It would have been obvious to apply the channels of Haberger as an improvement to the Moriceau method to allow for the penetration of a chemical etchant.

24. As to claim 19, Moriceau does not appear to explicitly disclose reducing the thickness of the superstrate and/or substrate. However, Haberger teaches in a method for producing a thin substrate: bonding two substrates to create a wafer stack, and thinning the wafer stack from one side down to the desired thickness (abstract, column 5 lines 5-10). It would have been obvious to apply the thinning method of Haberger to the method of Moriceau as an improvement to achieve a silicon wafer having the desired thickness.

25. As to claims 29 and 30, Moriceau does not appear to explicitly disclose producing projecting portions in the substrate or superstrate on the intermediate layer side. However, Haberger teaches in a method for producing a thin substrate: forming a bonding (intermediate) layer having channel-shaped recesses in order to permit the penetration of an etching agent for subsequent separation (abstract, column 3 lines 63-66). The bonding layer with recesses formed therein/thereon is depicted at figures 1a and 1b. The formation of channel-shaped recesses constitutes the formation of rectilinear projecting portions extending to the sides of the intermediate layer (since it extends along the sides through the substrate depicted at figure 1). Since the substrates 1 and 2, and bonding layer 4 having channels 5, are formed into an integral structure at figure 1b, the bonding layer 4 is a part of the substrates 1 and 2, so the channels are also formed in the substrates as required by the claims (See MPEP 2144.04 V Section B). Alternatively, the channels can be formed in either substrate (column 4 lines 54-57). It would have been obvious to apply the channels of Haberger as an improvement to the Moriceau method to allow for the penetration of a chemical etchant.

26. As to claim 32, Moriceau does not appear to explicitly disclose reducing the thickness of the superstrate and/or substrate. However, Haberger teaches in a method for producing a thin substrate: bonding two substrates to create a wafer stack, and thinning the wafer stack from one side down to the desired thickness (abstract, column 5 lines 5-10). It would have been obvious to apply the thinning method of Haberger to the method of Moriceau as an improvement to achieve a silicon wafer having the desired thickness.

27. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Moriceau et al. (WO 99/35674) as applied to claims 1-4, 6, 7, 11, 12, 14, 18, 20, 31, and 33 above, and further in view of Stierman et al. (US 4,979,015). For the purposes of examination, (US 6,756,286) will be used as an English Language Equivalent for WO 99/35674.

28. As to claim 13, Moriceau does not appear to explicitly disclose that the silicon oxide layer 34 is deposited by forming a thermal oxide. However, Stierman teaches in a method for making an insulated substrate for an integrated circuit device: creating a thermal silicon oxide layer by treating a deposited layer of silicon in a furnace (column 4 lines 59-63). It would have been obvious to substitute the Stierman method for forming a (thermal) silicon oxide as a conventional alternative or substitutable method for depositing the oxide layer onto a silicon substrate in the Moriceau method.

Response to Arguments

29. Applicant's arguments filed 02 June 2010 have been fully considered but they are not persuasive.

30. In response to applicant’s arguments with respect to claim 1: please see the rejection above. Moriceau teaches the formation of inclusions by applying heat to a highly doped silicon film, and Moriceau teaches that inclusions meet the required micro-bubbles or micro-cavities. The formation of inclusions depends on the degree of doping (column 5 lines 20-37, column 7 lines 32-45, column 12 lines 49-50). Moriceau further

teaches the propagation of these micro-bubbles or micro-cavities using heat treatment (column 10 lines 13-17). The extrinsic boron atoms therefore cause, either directly or indirectly, the formation of inclusions, micro-bubbles, and micro-cavities in the highly doped silicon film.

Conclusion

31. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ATUL KHARE whose telephone number is (571)270-7608. The examiner can normally be reached on Monday-Thursday 7:30 a.m. - 5:00 p.m. EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Christina Johnson can be reached on (571)272-1176. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/ATUL KHARE/
Examiner, Art Unit 1791

/Matthew J. Daniels/

Primary Examiner, Art Unit 1791

6/16/10